What we claim is

1. A selective hydrogenation catalyst for selectively hydrogenating unsaturated hydrocarbon, which comprises mainly the following active components loaded on a porous inorganic supporter:

(1) at least one of Pt, Pd, Ni, Ru, Co, and Rh;

(2) at least one of Ag, Cu, Zn, K, Na, Mg, Ca, Be, Sn, Pb, Sr, Ba, Ra, Fe, Mn, Zr, Mo, and Ge;

(3) at least one of rare earth metals; and

(4) Bi;

wherein the rare earth metal is selected from Sc, Y, and Lanthanides in Group IIIB of periodic table of elements.

2. The catalyst according to claim 1, wherein the weight percent of the active component (1) is 0.001-1%, based on the total weight of catalyst.

3. The catalyst according to claim 1, wherein the weight percent of the active component (1) is 0.008-0.3%, based on the total weight of catalyst.

4. The catalyst according to claim 1, wherein the weight percent of the active component (1) is 0.01-0.15%, based on the total weight of catalyst.

5. The catalyst according to claim 1, wherein the weight percent of the active component (2) is 0.001-10%, based on the total weight of catalyst.

6. The catalyst according to claim 1, wherein the weight percent of the active component (2) is 0.01-2%, based on the total weight of catalyst.

7. The catalyst according to claim 1, wherein the weight percent of the active component (3) is 0.01-5%, based on the total weight of catalyst.

8. The catalyst according to claim 1 wherein the weight percent of the active component (3) is 0.05-3%, based on the total weight of catalyst.

9. The catalyst according to claim 1, wherein the weight percent of the active component (3) is 0.1-1.5%, based on the total weight of catalyst.

10. The catalyst according to claim 1, wherein the weight percent of the

active component (4) is 0.001-5%, based on the total weight of catalyst.

11. The catalyst according to claim 1, wherein the weight percent of the active component (4) is 0.005-1%, based on the total weight of catalyst.

12. The catalyst according to claim 1, wherein the active component (1) is Pd.

13. The catalyst according to claim 12, wherein the thickness of Pd layer of the catalyst is 5-30 μ m.

14. The catalyst according to claim 1, wherein the active component (2) is Ag.

15. The catalyst according to claim 1, wherein the active component (2) is Ag and K.

16. The catalyst according to claim 1, wherein the active component (2) is Ag and Na.

17. The catalyst according to claim 1,wherein the rare earth metal is selected from the group consisting of La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, or mixtures thereof.

18. The catalyst according to claim 1, wherein the rare earth metal is La and/or Nd.

19. The catalyst according to claim 1, wherein the supporter is selected from the group consisting of diatomaceous earth, spinel, SiO_2, TiO_2, Al_2O_3, and two or more combinations thereof, which shape is granular, spherical, gear-shaped, laminar, or strip, and specific surface area is 1-200m^2/g.

20. The catalyst according to claim1, wherein the supporter is selected from Al_2O_3, TiO_2 or SiO_2, which shape is gear-shaped, and specific surface area is 2-120m^2/g.

21. The catalyst according to claim 1, wherein the shape of supporter is gear-shaped, its specific surface area is 2-50m^2/g.

22. A process for preparing the catalyst according to claim 1, wherein the rare earth metal component is loaded first, or the rare earth metal

component and K or Na component are loaded cocurrently first, and then other active components are loaded stepwise or concurrently.

23. A process for selectively hydrogenating alkyne and diolefin having two to four carbon atoms in C_2 fraction or C_3 fraction from petroleum hydrocarbon thermal cracking process into olefin by using the catalyst according to claim 1.

24. A process for selectively hydrogenating alkyne and diolefin having two to four carbon atoms in C_2 fraction or C_3 fraction fraction from petroleum hydrocarbon thermal cracking process into olefin by using the catalyst according to claim 15.